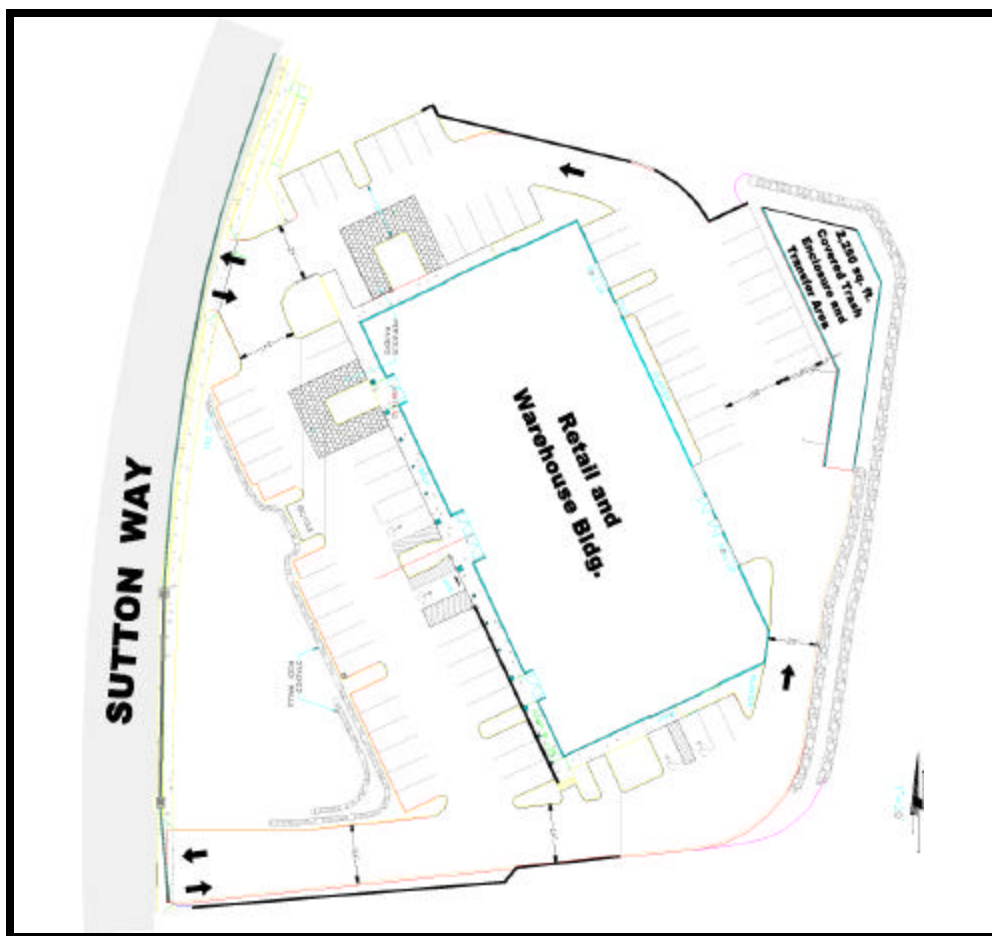


**PRISM**  
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## DUPELL COMMERCIAL PROJECT FINAL TRAFFIC IMPACT STUDY

Prepared for  
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## Executive Summary

The DuPell Commercial Project will create a significant impact to the surrounding street system, but implementation of programmed mitigations will bring traffic levels of service into the satisfactory LOS D or better range.

The project will increase the delay at all intersections studied, with some critical intersections increasing by more than 10% (i.e., Sutton Way at Brunswick, see Table 3). However, the project itself does not create any new mitigation needs that have not already been identified in previous traffic studies. The payment of the standard regional mitigation fee satisfies the mitigation requirement for this project. The needed mitigations are identified in this report for convenience.

Mitigations are needed at three of the five study intersections, namely:

- Brunswick Road at Sutton Way.
- Brunswick Road at SR 20/49 WB Ramps.
- Brunswick Road and Nevada City Highway.

The first two locations are already programmed for mitigation in the regional transportation improvement program, and in the Caltrans state highway operations protection program (SHOPP). Each of the three mitigations are fairly minor and involve doing the following:

### **Mitigation #1: Brunswick Road at Sutton Way.**

This intersection is planned to be mitigated with an additional left turn pocket on the Brunswick Road eastbound approach. This improvement is on the capital improvements list for the regional mitigation fee program. The planned mitigation consists of modifying the intersection lane striping to allow for an additional lane on the eastbound Brunswick Road to northbound Sutton Way turning movement. This improves the LOS E condition to an LOS D condition. Figure ES.1 shows a graphical representation of this mitigation.

In order to implement this additional left turn pocket, Brunswick Road will need to be widened on the north side just east of Sutton Way. This will allow for a safe alignment of the through lanes on Brunswick Road with the newly striped through lanes headed for the Brunswick SR 20/49 bridge.



**Mitigation #2: Brunswick Road at SR 20/49 WB Ramps.**

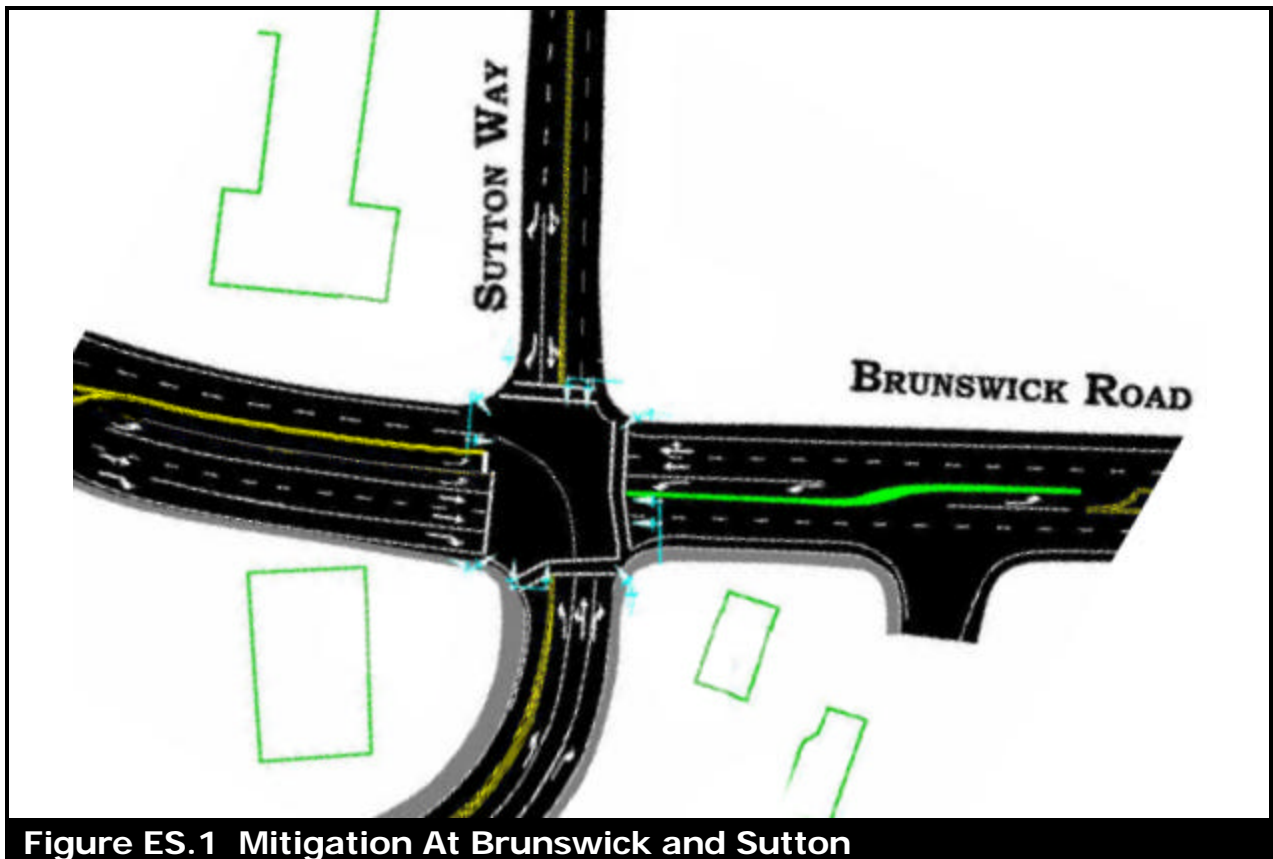
This Caltrans controlled intersection has been planned for an improvement consisting of adding an additional left turn pocket to the offramp approach. Caltrans will make the improvement as part of the Caltrans SHOPP. This improves the LOS E condition to and LOS D condition. Figure ES.2 shows a graphical representation of this improvement. This improvement has been under construction, and is near completion at the time of this report.

**Mitigation #3: Brunswick Road and Nevada City Highway.**

The traffic operations at this intersection are hindered by poor lane utilization on the southbound Nevada City Highway approach (as described in more detail later in the report). There is currently a dual left turn pocket, and a shared through/right lane, for a total of three southbound lanes approaching the intersection. Mitigation of this intersection is dependent on mitigation of an adjacent intersection, namely, the SR 20 WB onramp. In order to have improved lane-utilization at the Nevada City Highway/Brunswick Road intersection, it is necessary to have a dual lane onramp for the SR 20 freeway.

It is recommended that the County and Caltrans consider modifying the SR 20 WB onramp to convert it to a dual lane onramp. It is also recommended that after this change is in place, that the southbound approach of the Nevada City Highway / Brunswick Road intersection be modified to have a "Freeway Only" lane in the center lane (the right-most lane of the left turn pocket). The inside lane of the left turn pocket would have signing to communicate that freeway access is possible from that lane. Appropriate signing should also be installed at the side of road as well as overhead. Figure ES.3 illustrates this mitigation.





**Figure ES.1 Mitigation At Brunswick and Sutton**

Figure ES.1 shows that Sutton Way has been restriped on the east side to accommodate two inbound lanes to receive the two lanes of traffic from the expanded eastbound left turn pocket on Brunswick Road (which was expanded from one to two lanes). Some widening of Brunswick Road will be required to achieve this mitigation (approximately 4-6 feet on north side, east of Sutton).

Figure ES.2 shows the Brunswick and SR 20 WB Offramp mitigated to LOS D conditions through Caltrans adding an additional left turn lane (widen slightly and revise striping) to make a dual left turn movement. This improvement has been under construction, and is now nearly completed.

Figure ES.3 identifies which lane would be designated as "freeway only" to better direct traffic through the intersection, and improve lane utilization. The effectiveness of this change depends on whether or not a dual lane onramp is installed.



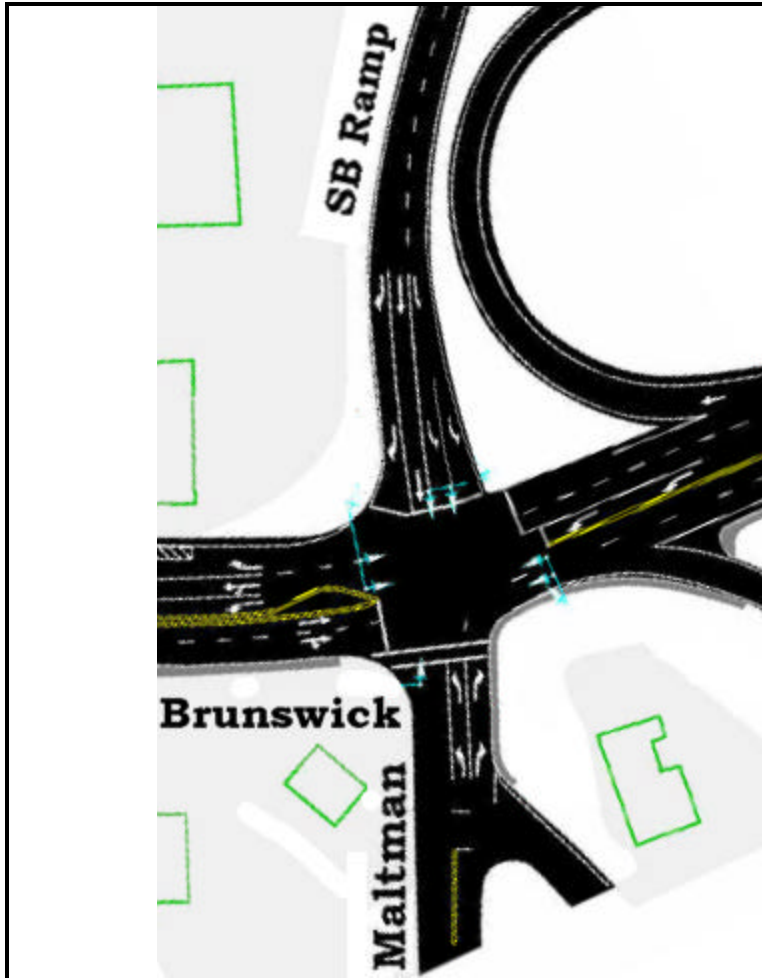


Figure ES.2 Mitigation at Brunswick Road and SR 20 WB Off- Ramp

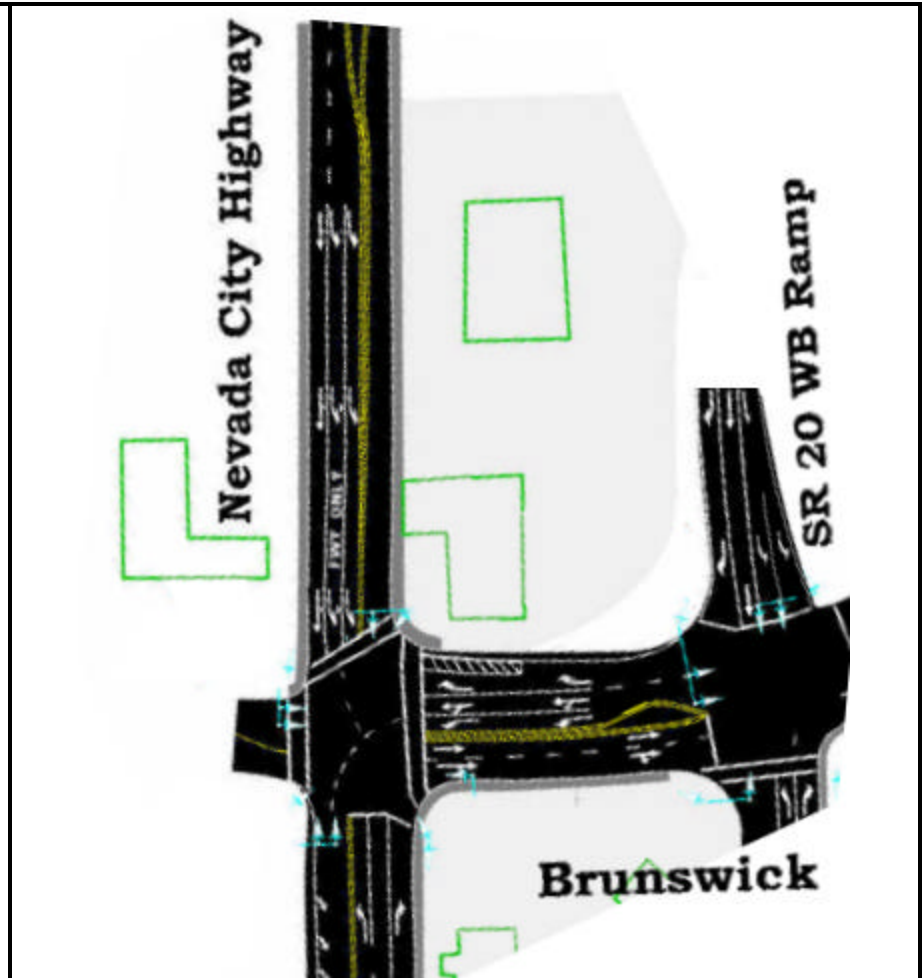


Figure ES.3 Mitigation at Brunswick and Nevada City Highway





## Introduction and Overview

The project study area is comprised of the intersections along Brunswick Road inclusive of Old Tunnel Road to the Nevada City Highway. The purpose of this study is to determine the project's traffic impact on the surround street system, and present any needed mitigations for traffic conditions at LOS E or worse conditions.

### Sutton Way Intersection at Brunswick Road

This intersection currently operates at LOS D/E conditions. One of the existing capacity problems at the intersection is with the left turn pocket on Brunswick Road eastbound for traffic entering Sutton Way to the north (see Figure ES.1). This turn pocket is only 250 feet in length, but the pm peak hour traffic volume is 377 vph for existing conditions, and is projected to go to 492 vph in the Year 2027.

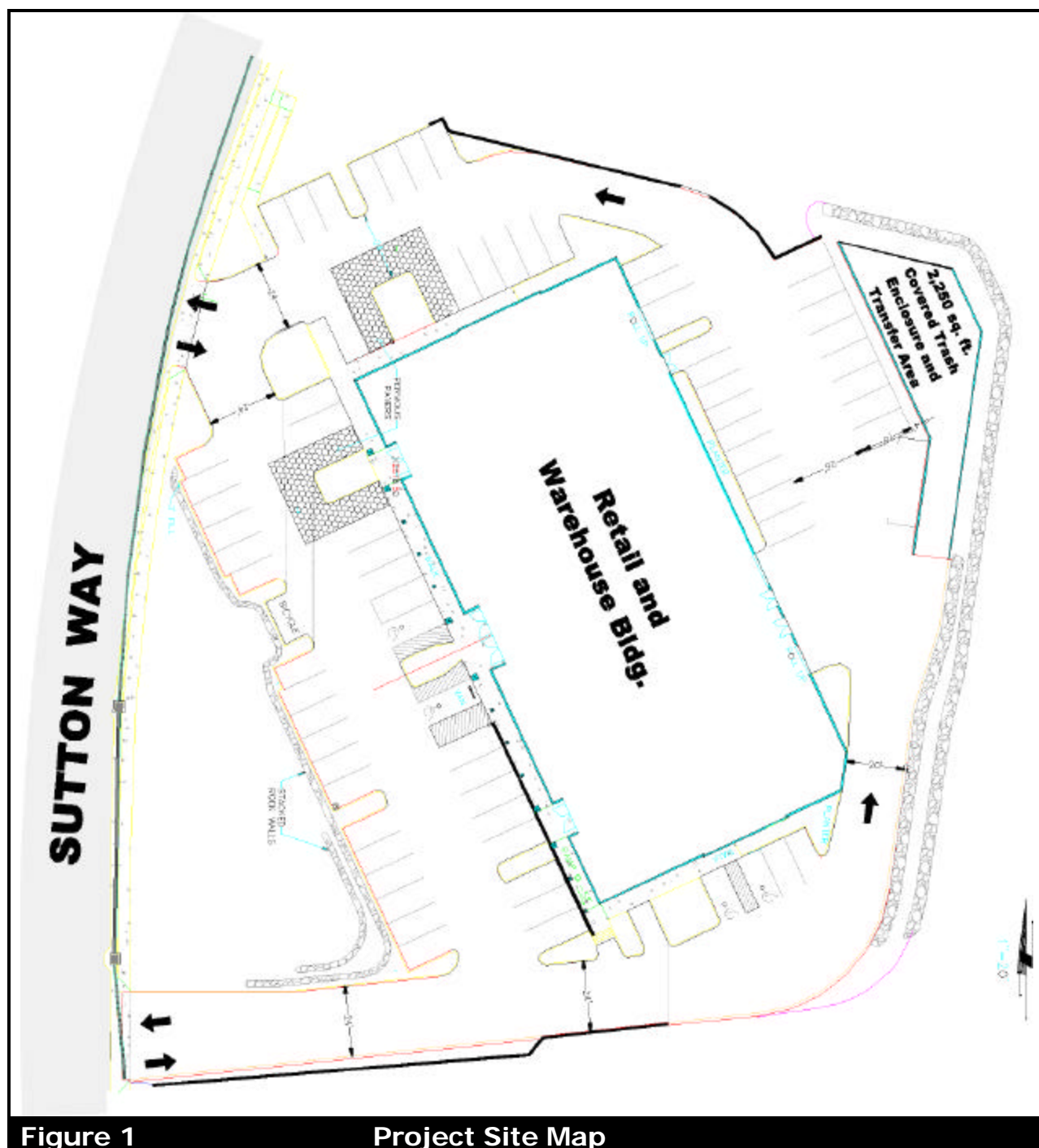
### Project Description

The proposed project includes the development of the following:  
A mixed use development of commercial retail, and warehousing / storage facilities.

Land Use	Quantity
Free Standing Discount Store #1	4.490 KSF
Free Standing Discount Store #2	5.085 KSF
Free Standing Discount Store #3	3.915 KSF
Warehousing	5.800 KSF
Supporting Office	0.877 KSF
Storage	3.923 KSF

Figure 1 illustrates the project site. The project site is located on Sutton Way to the north of Brunswick Road, accessing via two driveways on the east side of Sutton Way. Figure 1 shows the detailed project site map. There are two driveways planned for the site. Vehicles and trucks can enter the south driveway and travel around the rear side of the store location, and exit on the opposite (north) driveway without the need for turnaround in the project site itself.







## Study Area Roadways

**Brunswick Road:** A four lane arterial facility in the vicinity of the project (near Sutton Way). There is some additional widening at intersection approaches to accommodate turn lanes, etc. This is a major arterial roadway, currently carrying over 1,600 vehicles per hour in the pm peak hour (approximately 16,000 vehicles per day). Bridge volumes over the SR 20/49 freeway are even higher at 2,640 vehicles per hour during the pm peak hour. Terrain is flat to rolling hills, with some mountainous (steeper than 6%) outside of the study area.

**Sutton Way:** A two lane collector facility that runs from Idaho Maryland on the south to its dead end north of Brunswick Road. This road has a two way left turn lane median in the vicinity south of Brunswick Road to service commercial development adjacent to both sides of the road. Sutton Way south also widens out at its intersection with Brunswick Road to a four lane cross-section to accommodate one lane in from Brunswick and three lanes out to Brunswick. The north leg of Sutton Way/Brunswick Road intersection has one inbound northbound lane (towards the project), and two outbound southbound lanes (approaching Brunswick Road). Terrain is flat to rolling hills.

**Old Tunnel:** A two lane collector roadway that connects Brunswick Road on the south to Banner Lava Cap on the north. Traffic demand using this road is primarily from Brunswick Road to the west (2/3), and the remaining third travels to and from the east on Brunswick Road. The grades on this road are mountainous (steeper than 6%).

## Study Area

The study area for this report consists primarily of the Brunswick and Sutton Way street systems in the vicinity of the project site. Included are specific intersections along Brunswick Road and the Sutton Way access to the project site. The intersections studied in this report include the following:

Intersection	Traffic Control
Brunswick at Nevada City Hwy	Signal
Brunswick at SR 20 WB Ramps	Signal
Brunswick at SR 20 EB Ramps	Signal
Brunswick at Sutton Way	Signal
Brunswick at Old Tunnel	Stop Sign on Old Tunnel

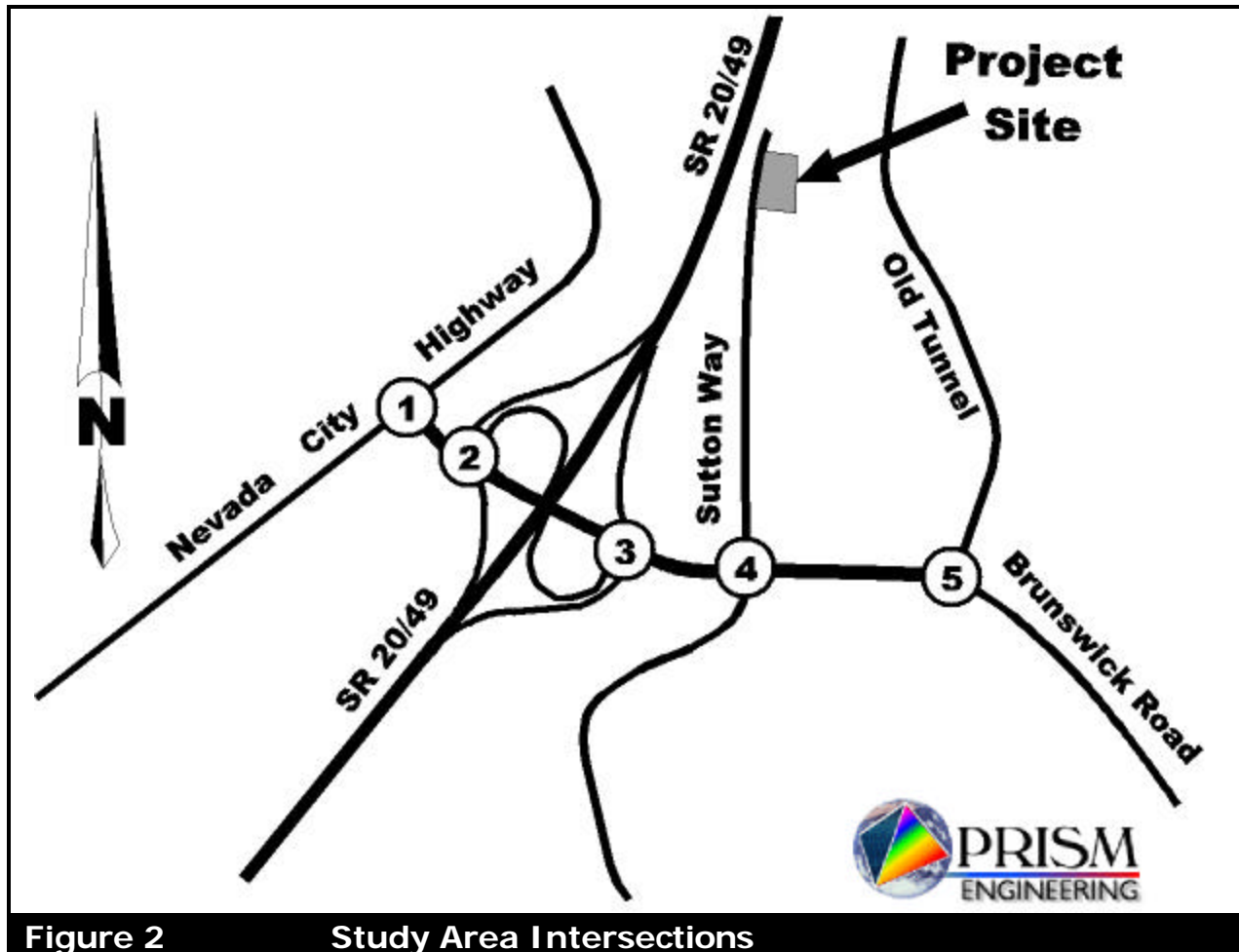


Figure 2 is a vicinity map showing the location of these five intersections in the study area, as well as the project site location. The project site is located at the northern end of Sutton Way, north of Brunswick Road.

Figure 3 shows several project study intersection on site photographs for critical intersections.

Figure 4 shows the existing intersection lane details for Brunswick Road at each of the study intersections west and inclusive of Sutton Way.

Figure 5 shows the pm peak hour traffic volumes for each of the five study intersections.



**Figure 2 Study Area Intersections**





*Brunswick WB looking west from Sutton towards SR 20 EB Ramp intersection*



*Sutton Way NB looking north into Brunswick intersection, signal control*



*Sutton Way NB looking north towards Brunswick intersection (3 lane approach)*



*Brunswick EB looking east towards SR 20 / Maltman intersection, signal control*



*Nevada City Highway looking north to Brunswick intersection, signal control*



*Nevada City Highway looking south to Brunswick intersection (3 lane approach)*

**Figure 3**

**Project Area Intersection Photos**



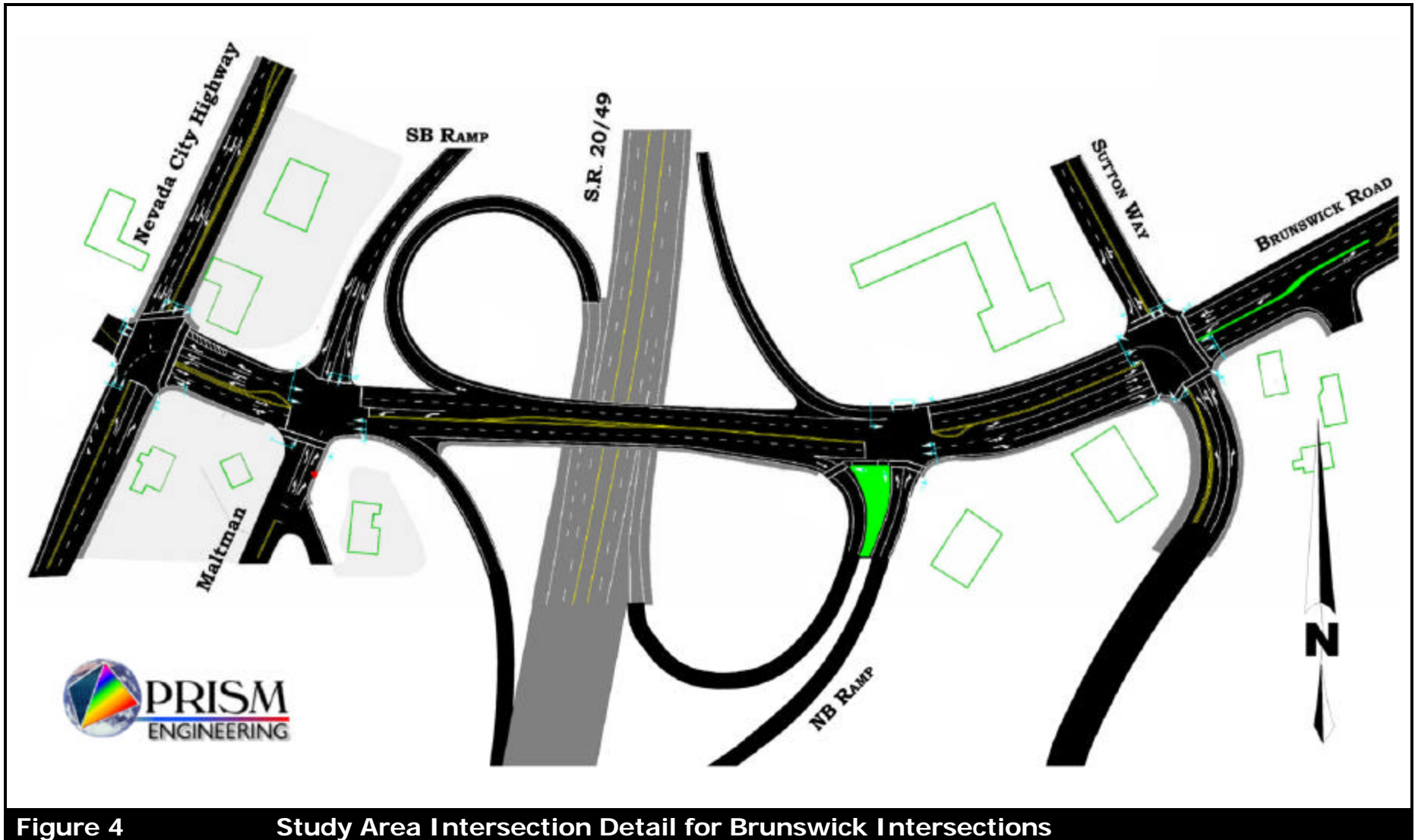


Figure 4 Study Area Intersection Detail for Brunswick Intersections





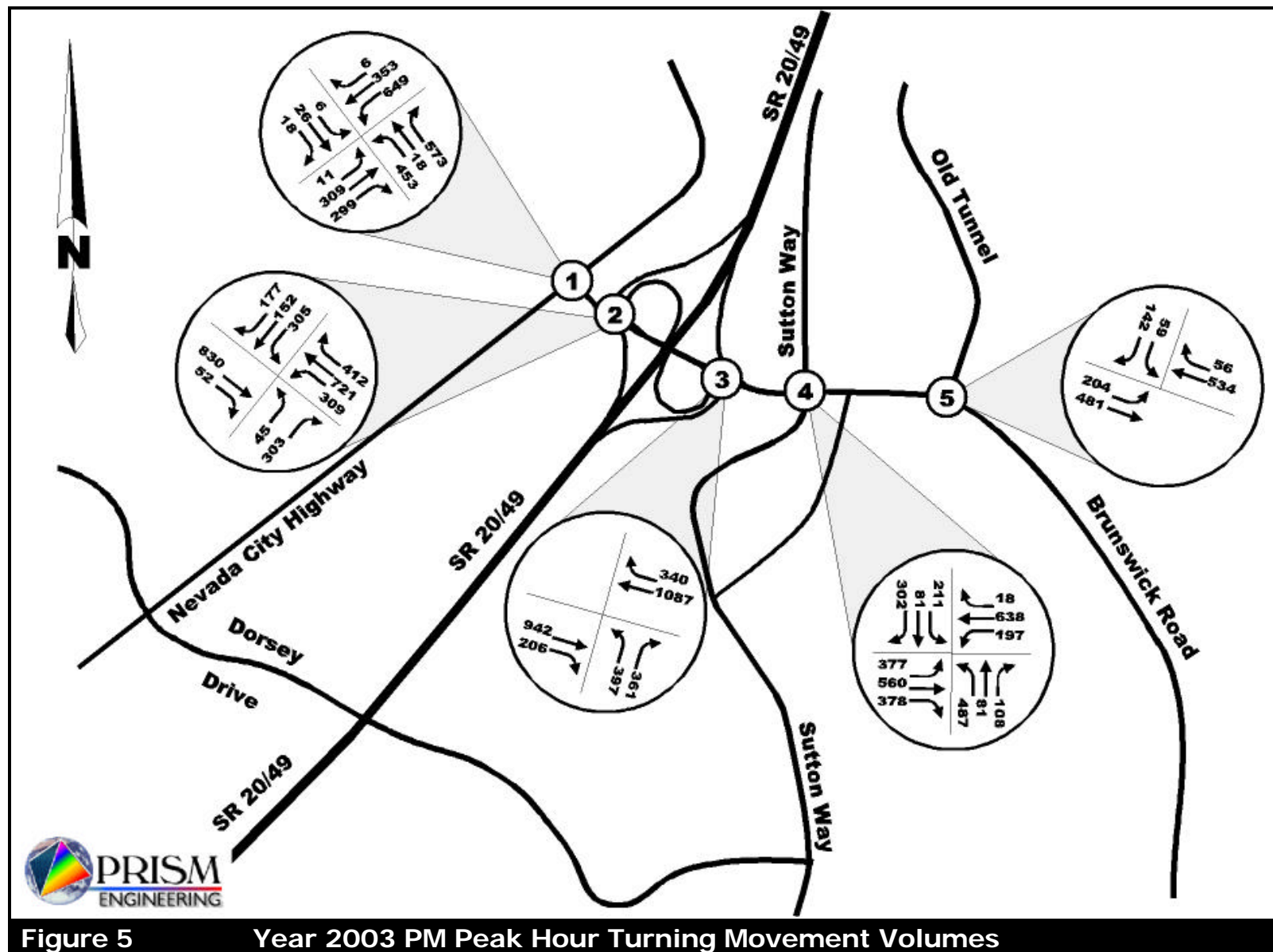


Figure 5 Year 2003 PM Peak Hour Turning Movement Volumes



## Project Trip Generation and Distribution

The project consists of a mixed use development with approximately 13,490 square feet of general retail space, combined with 10,600 square feet of warehouse, storage, and supporting office use. The ITE Trip Generation Manual provides descriptions of various land uses and gives associated trip generation rates. The land use code selected for this project was "Free Standing Discount Store" or ITE land use code 815. The description in the ITE Trip Generation Manual, 6<sup>th</sup> edition is given as follows:

*"The discount stores in this category are free-standing stores with off-street parking. They usually offer a variety of customer services, centralized cashiering, and a wide range of products. They typically maintain long store hours seven days a week... Free-standing discount stores are also sometimes found as separate parcels within a retail complex with their own dedicated parking."*

Such is the case with this project, in that it has its own dedicated parking, a free-standing store building which will sell a variety of products and appliances. For the remaining warehousing and storage land uses, the ITE code 150 was used (warehousing), which includes storage and office.

**Table 1**  
**Trip Generation Summary**

ITE Code	Land Use	Quantity	Peak Hour Trip Rate	Peak Hour Trips
815	Free Standing Discount Store #1	4.490 KSF	4.24	19.0
815	Free Standing Discount Store #2	5.085 KSF	4.24	21.6
815	Free Standing Discount Store #3	3.915 KSF	4.24	16.6
150	Warehousing	5.800 KSF	0.51	3.0
150	Supporting Office	0.877 KSF	0.51	0.4
150	Storage	3.923 KSF	0.51	2.0
PM Peak Hour Total >>>				<b>63</b>

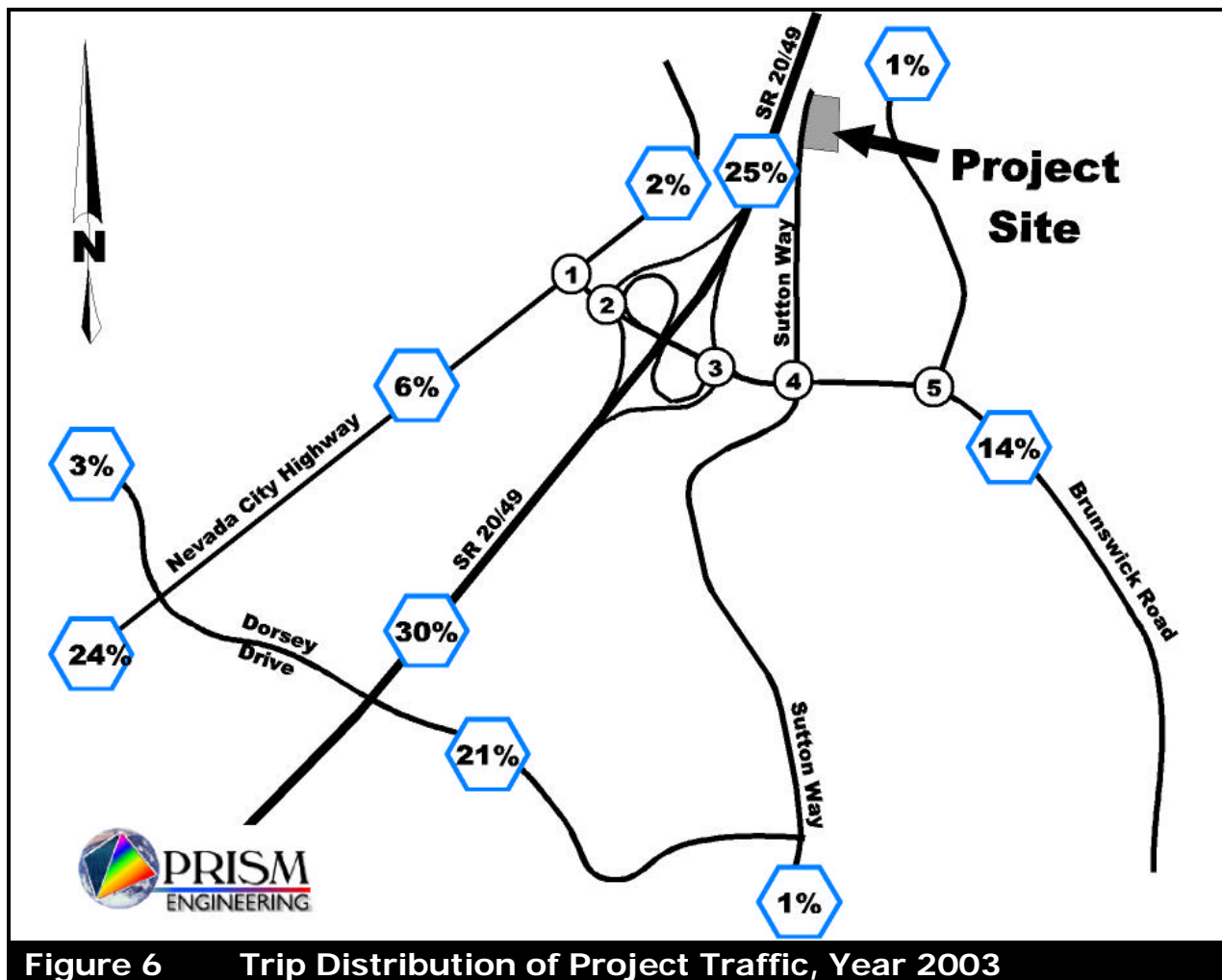
Source: ITE Trip Generation Manual, 6<sup>th</sup> Edition

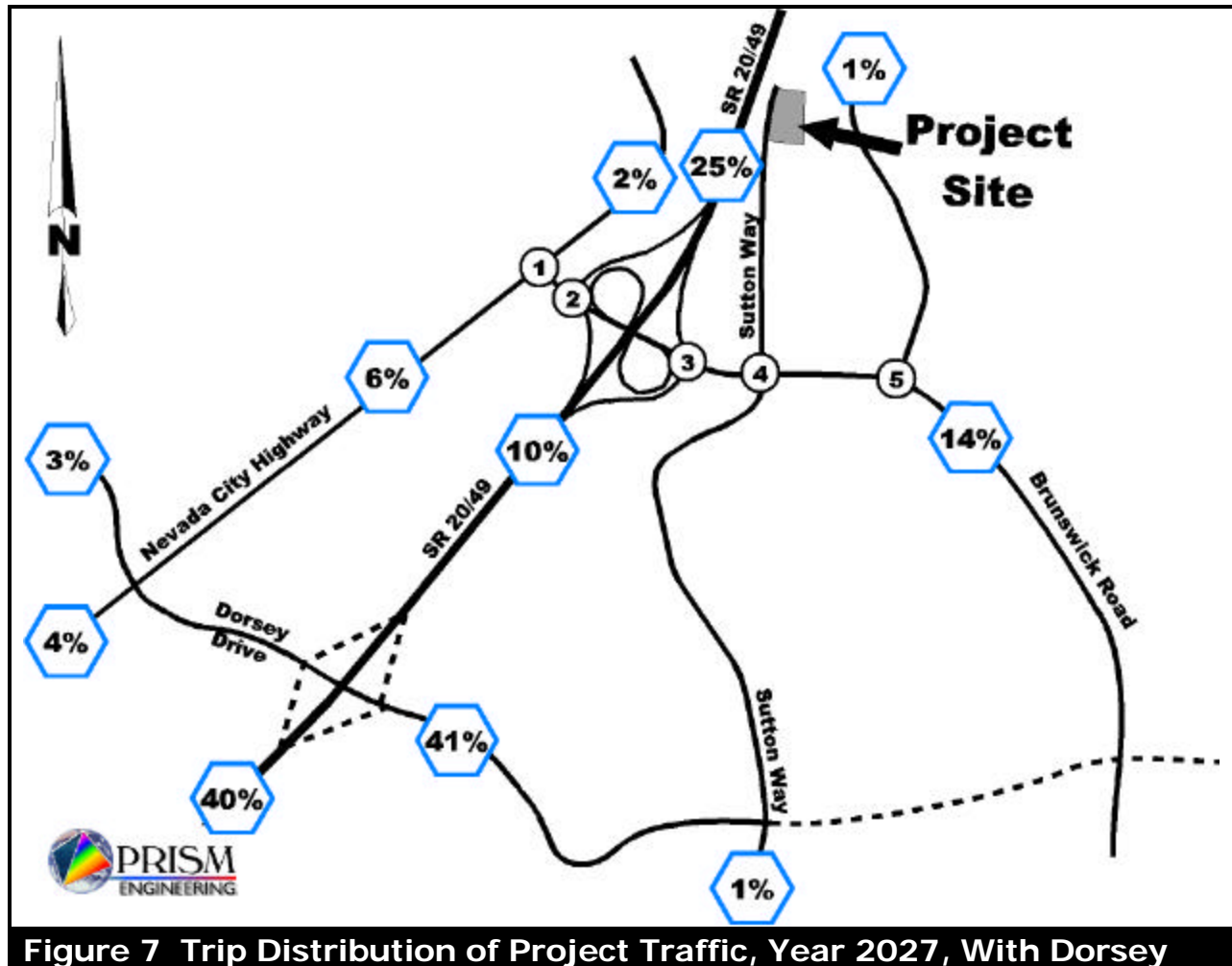




The project's trip generation is expected to have the greatest impact during the pm peak hour time period, or when the highest volumes are expected on adjacent streets (midweek peak hour between 4:00-6:00 pm). The project trip generation during the pm peak Hour of an average midweek day is the focus of the scenarios in this traffic study.

The trip distribution of the project traffic was done with the aid of the NCTC MINUTP traffic model, and patterned after the work completed in the Brunswick Basin Corridor Study as well as the recently developed NCTC TP+ model. Traffic volumes for existing conditions were updated to Year 2003 conditions, and the future cumulative traffic projections were updated from Year 2020 to Year 2027 conditions. Two figures, Figure 6 and 7, have been developed to define how the project traffic was distributed for the existing plus project conditions, as well as the future plus project conditions, respectively.





It can be seen from comparing Figures 6 and 7 that the project trip distribution is expected to change with the installation of the Dorsey Drive future freeway interchange. Since Brunswick Road is more congested than Sutton Way, it was assumed that some of the project traffic would seek to use Sutton Way west of Brunswick to gain access to the future Dorsey Drive interchange once it is constructed.

Figure 7 shows how the percentage of project traffic expected to use Dorsey Drive increased from 21% for existing Year 2003 conditions, to 41% for the Year 2027 conditions. In addition, the amount of project traffic estimated to use SR 20 to go to the south also increased from 30% to 40% (traffic shifted slightly from surface streets to freeway). This is due to the increased convenience and ability of future project traffic to get onto the freeway by virtue of the future Dorsey Drive freeway interchange.



## Traffic Analysis

The traffic analysis examines the Year 2003 plus project as well as the Year 2027 plus project scenarios. The study intersections in the vicinity of the project site include:

Intersection	Traffic Control
Brunswick at Nevada City Hwy	Signal
Brunswick at SR 20 WB Ramps	Signal
Brunswick at SR 20 EB Ramps	Signal
Brunswick at Sutton Way	Signal
Brunswick at Old Tunnel	Stop Sign on Old Tunnel

The existing and future turning movements for these intersections are identified on Figures 5 and 8. The existing pm peak hour turning movements were taken from previously completed reports<sup>1</sup> and factored up to Year 2003 conditions. These are shown in Figure 5 for the existing conditions. Figure 8 shows the Year 2027 traffic projections (which take into account the installation of the Dorsey Drive freeway interchange, lowering volumes in the Brunswick Basin interchange by about 15% overall).

## Methodology

Traffic volumes were developed using the NCTC's MINUTP and TP+ traffic models, with some adjustments to land uses along the Brunswick corridor as developed by Nevada County DOT. This study is intended to build upon the Brunswick Corridor Study due to the potential that the project has to alter the outcome of the results of that study. The Existing plus project, as well as the future (Year 2027) plus project traffic scenarios during the pm peak hour were selected as the analysis time periods for the purposes of this study.

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<sup>1</sup> CORRIDOR STUDY FOR BRUNSWICK ROAD FROM SR 20 TO SR 174, October 24, 2001, and Olympia Plaza II, November 19, 2001



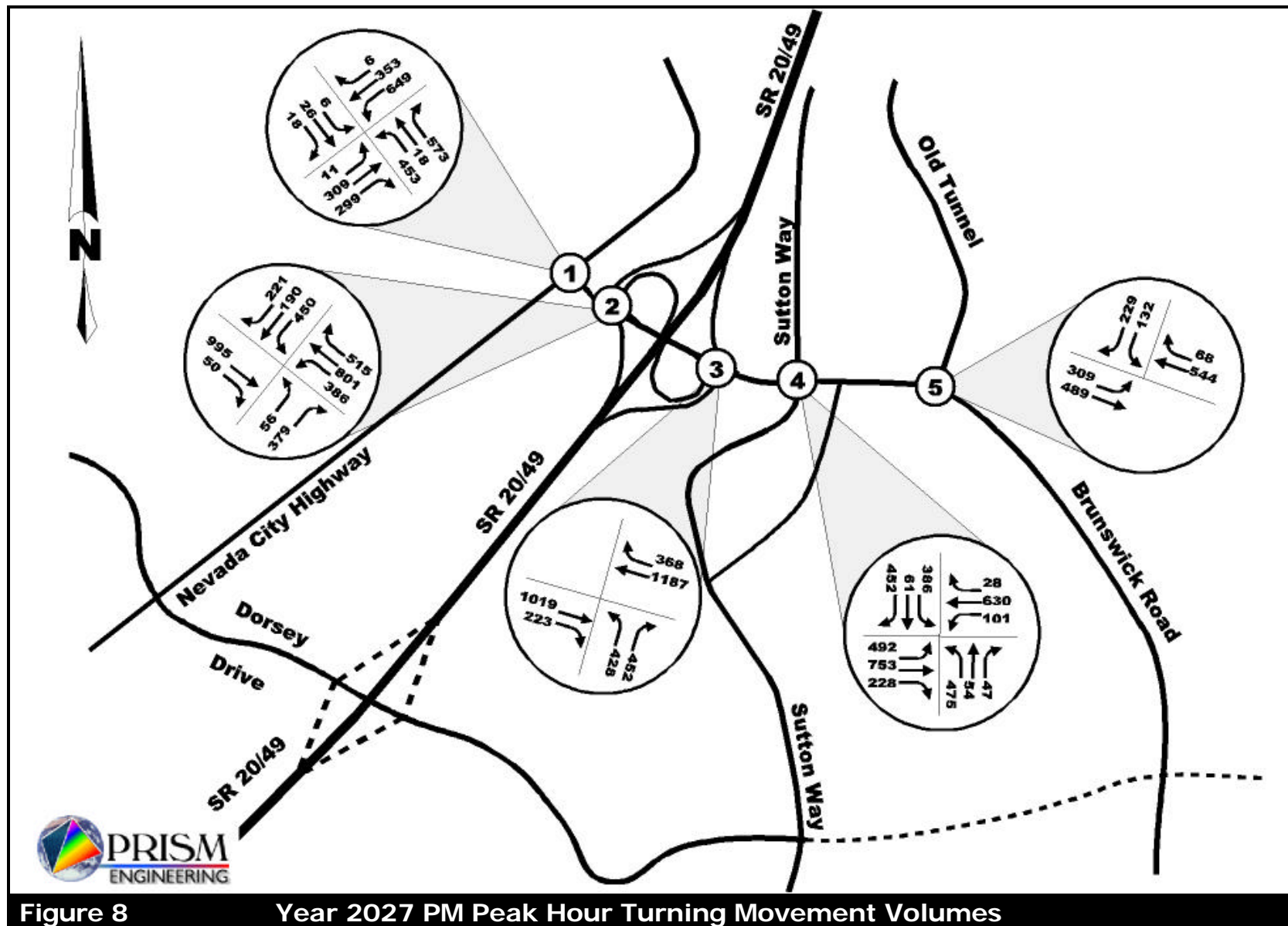


Figure 8

Year 2027 PM Peak Hour Turning Movement Volumes



Synchro 5.0 was utilized to calculate level of service for each of the study intersections. The Synchro software is capable of analyzing each intersection using the HCM 2000 methodology for signalized and unsignalized intersections. The HCM 2000 method is more conservative, and does not take into account the added benefits in level of service that various signal timing schemes can generate. For this reason, it is to be considered a worst-case analysis.

Reference is made to Table 2 for a summary of the “delay” level of service criteria used in the HCM 2000 methodology analyses. Levels of service were calculated using a delay criteria scale as follows:

**Table 2**  
**Delay Level of Service Criteria**

<b>LOS</b>	<b>Unsignalized</b>	<b>Signalized</b>
A	1-10 seconds	1-10 seconds
B	11-15 seconds	11-20 seconds
C	16-25 seconds	21-35 seconds
D	26-35 seconds	36-55 seconds
E	36-50 seconds	56-80 seconds
F	51+ seconds	81+ seconds

*Source: PRISM Engineering, Synchro Pro, and HCM 2000*

### Interpreting the “Delay” Level of Service

The Intersection Delay field shows the average control delay for a signalized intersection and it is calculated by taking a volume weighted average of all the delays for each movement in each intersection approach. This method of LOS rank is based on how well an intersection may operate given LOS enhancing mitigations through signal timing.

Table 3 follows, and reports the levels of service (based on HCM 2000 delay methodology) for the Year 2003 conditions, including mitigation.

Table 4 reports the levels of service for all Year 2027 scenarios, including mitigation.



**Table 3**  
**Year 2003 PM Peak Hour Analysis Summary**

No.	Location/Approach	2003		2003 + AP		2003+AP+PROJ		Mitigated	
		P.M. Peak Hour		P.M. Peak Hour		P.M. Peak Hour		P.M. Peak Hour	
		Delay <sup>1</sup>	LOS	Delay <sup>1</sup>	LOS	Delay <sup>1</sup>	LOS	Delay <sup>1</sup>	LOS
1	Brunswick and Nevada City Highway	60	E	60	E	61	E	35	D
2	Brunswick and SR 20/49 WB Ramps	56	E	60	E	61	E	44	D
3	Brunswick and SR 20/49 EB Ramps	15	B	15	B	16	B	16	B
4	Brunswick and Sutton	55	D/E	58	E	65	E	46	D
5	Brunswick and Old Tunnel	37	C	44	C	45	C	45	C

<sup>1</sup>Average delay per vehicle in seconds

LOS = Level of service

AP = Approved Projects

Source: PRISM Engineering, SynchroPro Software output (see appendix for details on calculations).

Mitigation includes better advance signing for NCH to improve lane utilization, an additional left turn pocket on SR 20 WB ramp, and an additional left turn pocket on Brunswick to Sutton





**Table 4**  
**Year 2027 PM Peak Hour Analysis Summary**

No.	Location/Approach	Year 2027 + PROJ					
		Year 2027		Year 2027 + PROJ		Mitigated	
		P.M. Peak Hour		P.M. Peak Hour		P.M. Peak Hour	
		Delay <sup>1</sup>	LOS	Delay <sup>1</sup>	LOS	Delay <sup>1</sup>	LOS
1	Brunswick and Nevada City Highway	43	D	43	D	43	D
2	Brunswick and SR 20/49 WB Ramps	66	E	66	E	31	C*
3	Brunswick and SR 20/49 EB Ramps	26	C	26	C	26	C
4	Brunswick and Sutton	47	D	53	D	53	D
5	Brunswick and Old Tunnel (unsignalized, stop on Old Tunnel only)	89% (ICU)	D	89% (ICU)	D	89% (ICU)	D

<sup>1</sup>Average delay per vehicle in seconds

LOS = Level of service

Source: PRISM Engineering, SynchroPro Software output (see appendix for details on calculations).

\*Mitigation includes installation of dual on ramp lanes



Table 3 indicates that three of the five study intersections are currently operating at LOS E conditions, which is unacceptable. When the project traffic is added in, the delay to each intersection is increased with the exception of the Nevada City Highway intersection because the volume increase due to the project is small at that remote intersection.

The final column in Table 3 reports what the level of service would be at each LOS E intersection if planned improvements are implemented as follows:

**Brunswick Road at Sutton Way.** This intersection would operate at LOS E conditions with or without the project traffic, and is planned to be mitigated. It is on the capital improvements list for the regional mitigation fee program. The planned mitigation consists of modifying the intersection lane striping to allow for an additional lane on the southbound Brunswick Road to Sutton Way turning movement. This improves the LOS E condition to an LOS D condition.

**Brunswick Road at SR 20/49 WB Ramps.** This Caltrans controlled intersection has been planned for an improvement consisting of adding an additional left turn pocket to the offramp approach. This improves the LOS E condition to and LOS D condition.

**Brunswick Road and Nevada City Highway.** The traffic operations at this intersection are hindered by poor lane utilization on the southbound Nevada City Highway approach to the intersection. There is currently a dual left turn pocket, and a shared through/right lane, for a total of three lanes approaching the intersection. Drivers typically get in the right-most lane of the dual left turn pocket, possibly so that they can more easily make a right turn later onto the freeway (after passing through the Maltman intersection) by already being in the lane that would make this turn movement. However, many of the drivers in this lane are seen traveling straight after passing the SR 20 WB onramp, indicating that they are either headed to the Sutton Way intersection, or turning to go north onto the SR 20 EB on loop.

Because of this travel behavior, mitigation of this lane-utilization problem is not straight-forward. It depends on what conditions exist “downstream” from the problem. For example, if there were two lanes onto the freeway, such as in a dual lane onramp, it would be possible for travelers to get in either lane on Nevada City Highway southbound and be able to get onto the freeway. But in order to implement a dual lane onramp, it would require



some realignment of Brunswick Road on the south side to add widening (as previously studied in the Nevada County Operations Study). If this improvement does not go in, then it does not appear that there is much more that can be done to improve the situation at the Brunswick Road / Nevada City Highway intersection (more particularly the poor lane-utilization on the southbound approach).

It is recommended that the County and Caltrans consider widening of the SR 20 westbound onramp to facilitate better lane-utilization on Brunswick Road and Nevada City Highway. If this is done, then the Brunswick Road / Nevada City Highway intersection can have the dual left turn pocket striped with a "Freeway Only" lane in the right-most lane. The inside lane would also have signing that communicates that the inside lane has the option to get on the Freeway too. Appropriate signing should also be installed at the side of road as well as overhead.



## APPENDIX

The following illustration is a sample of the Synchro Pro 5.0 street network that was developed and used for the existing and future analysis scenarios. The street network was loaded with pm peak hour turning movement data for the following scenarios:

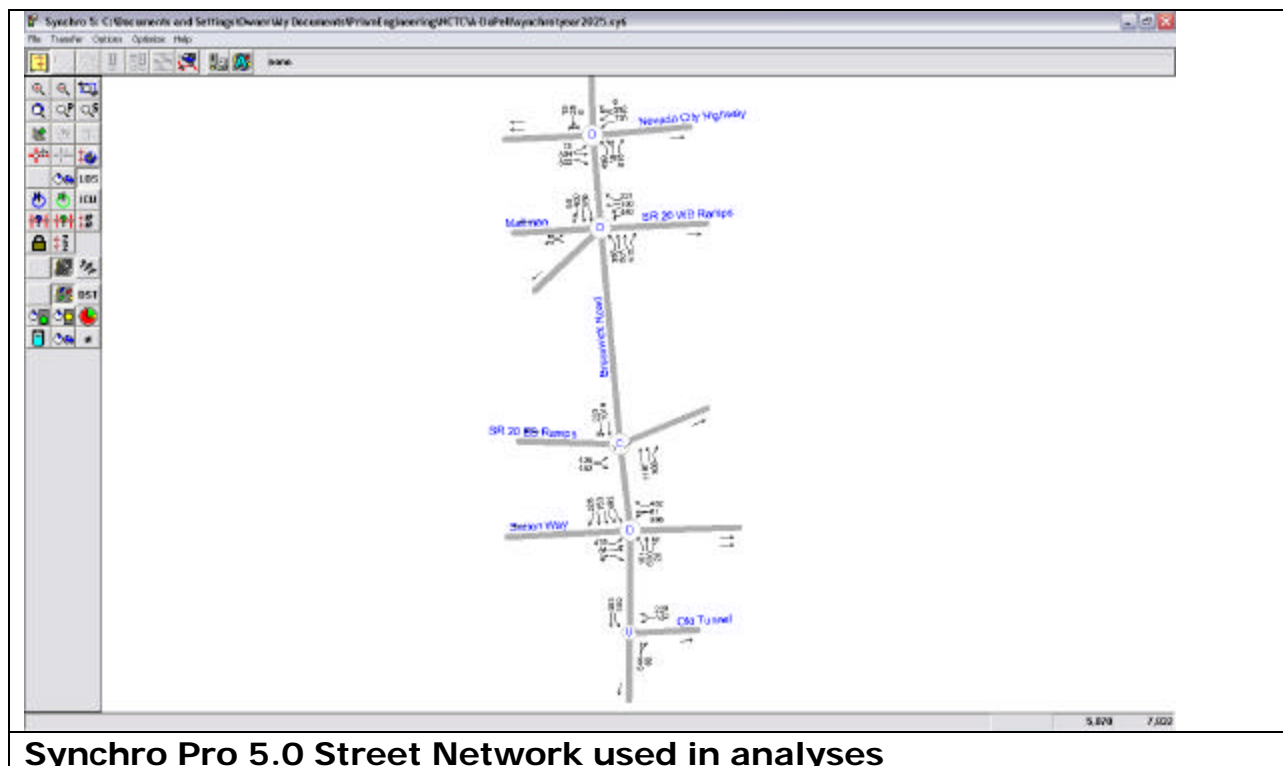
Existing Year 2003 pm peak hour turning movements

Existing Year 2003 + Approved Projects pm peak hour turning movements

Existing Year 2003 + AP + PROJECT pm peak hour turning movements

Future Year 2027 pm peak hour turning movements

Future Year 2027 + PROJECT pm peak hour turning movements



Note: The network shows Brunswick as a north/south street, as the majority of Brunswick Road runs in a north/south direction from its south end at SR 174, and because SR 20 runs primarily in an east/west direction from Yuba County on the west to Placer County on the east. This same convention was used in previous studies, such as the CORRIDOR STUDY FOR BRUNSWICK ROAD FROM SR 20 TO SR 174, October 24, 2001. In the appendix pages that follow, the traffic volumes developed for each scenario are reported for the Year 2003 and 2027 time periods within the SynchroPro calculations. The volumes represent the pm peak hour. The north/south/east/west conventions follow the figure above, with Brunswick being north/south, etc.

